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IMPACT OF MODERN AGRICULTURAL TECHNOLOGY ON SMALL FARMERS—A CASE STUDY IN ASSAM

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There are ample evidences to show that under the traditional system of cultivation, the small farmers can hardly improve their economic condition. It has also been observed that the economic conditions of the small farmers are gradually deteriorating due to fragmentation of land holdings and recurring deficit family budgets. On the other hand, it is believed that the small farmers can be made economically viable units by adopting modern agricultural technology. However, little empirical evidence exists to judge the impact of modern agricultural technology on the economic conditions of the small farmers. The present case study was undertaken to examine as to whether the small farms can be made potentially viable units under the improved method of agricultural practices.

EXTENT OF SMALL FARMERS IN ASSAM

The Agricultural Labour Enquiry has shown that in Assam 62 per cent of the total number of holdings, covering 32 per cent of the total area were below 2.025 hectares.[1] Considering 2.025 hectares as the basic economic holding per family, 63 to 69 per cent of the families have less than an economic holding. The average size of holdings of the smaller size-group below 1.34 hectares (excluding landless) which accounted for 35 to 40 per cent of the rural families was between 0.405 hectare to 0.672 hectare only.[2] Nearly one-sixth of the rural families in Assam is landless.

A study on the problems of small farmers of Assam by the Agro-Economic Research Centre, Jorhat, showed that 16.57 per cent of the households were landless, 21.72 per cent of the households had land holdings below 0.405 hectare and another 22 per cent between 0.405 to 1.013 hectares.[3] These 43.72 per cent of the households possessed only 14.39 per cent of the total land resources of the village. Moreover, 17.71 per cent of the households had land holdings between 1.013 to 2.025 hectares. That means, two-thirds or 61.43 per cent of the farmers have land holdings which are uneconomic or 'nearly economic' size of holdings.

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1. Agricultural Labour Enquiry: Report on Intensive Survey of Agricultural Labour, Vol. III—East India, Ministry of Labour, Government of India, Delhi, 1955.
2. P. C. Goswami: Economic Development of Assam, Asia Publishing House, Bombay, 1963, pp. 49-50.
3. P. C. Goswami and P. D. Saikia: Problems of the Small Farmers in Assam, Agro-Economic Research Centre for North-East India, Jorhat, 1969.

Although the land holding pattern is the most important factor in the rural economy, it does not always reflect the real situation of the area under operation, that is, farm sizes. In the five villages under reference, 18.59 per cent of the households had operational holdings of below 0.405 hectare of land and the average size of operational holding was 0.130 hectare. Moreover, 17 per cent of the families had operational holdings between 0.405 to 1.013 hectares with an average size of 0.720 hectare. Thus 35.58 per cent of the households possessed upto 1.013 hectares of operational holdings with an average holding of 0.410 hectare. This is the most vulnerable section of the population in the villages. Only 33.65 per cent of the households had somewhat economic operational holdings between 1.013 to 2.025 hectares. This group of households had an average size of operational holding of 1.478 hectares. In these five villages, the average size of operational holding was 1.713 hectares only. This points out the magnitude of the small sized farms in the Assam plains.

The same study revealed that the farms of below 2.025 hectares could not provide a subsistence income for the maintenance of the family. But the average family budgets of the households having more than 2.025 hectares of land are found to be marginally surplus. It may also be noted that the family income is counted from all the sources of income and not limited to the farm income only. These facts clearly point out that under the traditional system of agriculture, the small farmers cannot afford to have a balanced family budget.

CASE STUDY

The case study was undertaken by the authors in village Nahotia, situated at a distance of about 11 km. from the Jorhat town, the district headquarters of the district of Sibsagar, Assam. The village was selected for the study purposively, because of the adoption of improved agricultural technology by almost all the farmers of the village. Since 1973, the Nahotia Electric Lift Irrigation Project has been functioning and the farmers are utilizing the irrigation facilities fully. Four electric lift pumpsets were installed to lift water from the waterlogged areas inside the embankment of the river Brahmaputra. This irrigation project was undertaken as a relief measure for the people who have settled in the new site as their original village site was eroded away by the river Brahmaputra.

Before the installation of this lift irrigation project, the farmers were accustomed to the traditional method of cultivation. Only a few farmer households used high-yielding varieties (HYVs) of paddy without adopting other improved package of practices. As the village is situated near the mighty river Brahmaputra, they could hardly cultivate the winter paddy successfully due to frequent floods. Winter crop was also not possible due to lack of irrigation facilities. With the extension of irrigation facilities, short duration

HYV paddy was introduced. The concerned agricultural officers demonstrated the package of improved agricultural practices among the farmers through demonstration plots and in this way, most of the farmers were convinced about the benefits of the improved practices.

Out of the 50 small farm families, 25 were selected by random sampling method. Primarily two sets of data, *i.e.*, the cropping pattern before the adoption of new technology and after the adoption of new technology, were collected.

LAND USE AND CROPPING PATTERN

The village was originally situated inside the embankment just by the side of the river Brahmaputra. Due to heavy erosion, the village was shifted to the new site outside the embankment. The villagers have occupied 0.023 hectare to 0.074 hectare land only per household in the new site for their homestead. In the original village site, about 70 per cent of selected households have land between 0.67 hectare to 1.62 hectares, which cannot be utilized during summer for *kharif* crops, and hence the same is utilized during winter for *rabi* crops only.

The cropping pattern in the village in *rabi* and *kharif* is shown in Table I.

TABLE I—CROPPING PATTERN BEFORE AND AFTER ADOPTION OF MODERN TECHNOLOGY

Name of crops	Before adoption (1972)			After adoption (1974)		
	Area (hectares)	Production (kg.)	Value (Rs.)	Area (hectares)	Production (kg.)	Value (Rs.)
Rabi						
Paddy (traditional variety) ..	19.96	17,876	14,370	7.42	11,196	9,000
HYV paddy	0.81	1,493	1,200	11.06	25,079	20,160
HYV wheat	13.62	11,815	11,800	12.81	12,875	12,800
Vegetables	2.37	—	22,400	3.00	—	24,200
Total	36.76	31,184	49,770	34.29	49,150	66,160
Kharif						
Paddy (traditional variety) ..	17.40	17,354	13,950	11.06	18,510	14,880
Paddy (HYV)	4.32	5,859	4,710	10.93	24,034	19,320
Wheat	Nil	Nil	Nil	Nil	Nil	Nil
Total	21.72	23,213	18,660	21.99	42,544	34,200

From Table I, it is evident that the whole cropped area is devoted for growing food crops only—both before and after the installation of the irrigation project. Before the functioning of the irrigation project, 54 per cent of the total cropped area was devoted to traditional *Ahu* paddy (*rabi*), but after the implementation of the irrigation project, they have shifted from the traditional to the improved method of cultivation and in 1974, *i.e.*, one year after implementation, the percentage of traditional *Ahu* paddy decreased from 54 per cent to 22 per cent, whereas the area under the HYV of paddy increased from 2 per cent in 1972 to 32 per cent in 1974. With the availability of water and application of fertilizers, the average yield of traditional *Ahu* paddy per hectare has also increased from 896 kg. in 1972 to 1,509 kg. in 1974 and that of the HYV paddy from 1,843 kg. to 2,268 kg. during the same period.

In *kharif* crops also, the data show that the percentage of area under the traditional *Sali* paddy has declined from 80 per cent to 50 per cent, whereas the area under *kharif* HYV shows an increase of 30 per cent. The yield rate of *kharif Sali* has increased from 997 kg. in 1972 to 1,674 kg. in 1974. The average yield of HYV of paddy increased from 1,356 kg. to 2,199 kg. during the same period.

It may be noted that the irrigation water is primarily used for paddy cultivation in the winter months. In case of drought, the irrigation water is provided for the *kharif* paddy crop also. Before irrigation, the farmers used to cultivate *Ahu* paddy by broadcasting method. After the implementation of the prodject, they cultivate HYV in *Ahu* season by transplanting method and the yield rate has increased considerably. The farmers grow HYV wheat successfully without irrigation. In the case of vegetables growing also, no irrigation water is used. The villagers get a substantial income from vegetables. The traders from the nearby Jorhat town collect the vegetables from the village.

The farmers are now anxious to raise three crops in a year on the same plot. But they are not in a position to adjust the timings due to climatic reasons, for growing three crops. At present I.R. 8, China 63, Pusa 21 and Ratna HYV paddy are cultivated by the farmers.

Out of 25 selected farm households, 70 per cent have applied fertilizers. Some of the farmers have not used fertilizers because it is difficult for them to carry fertilizers from the godowns located in the town. The farmers use pesticide only occasionally and reported that sometimes they do not get the pesticides in time. No one has used tractor for ploughing.

The land tenure system has, however, dampened the situation to some extent. The system of tenancy in the village is based mainly on cropsharing on 50:50 basis and a fixed rate of crop rent at the rate of 187 kg. per 0.405 hectare. Nearly 30 per cent of the operational holding under paddy

area are leased in land. The share-croppers feel the insecurity of their tenure. The land owners now receive a higher share from their fields as the crops are grown under improved methods.

ANNUAL INCOME

After the implementation of the irrigation project and the adoption of improved methods, the annual average income from agriculture has increased from Rs. 2,737 to Rs. 4,018 per family, an increase of 46 per cent, as is evident from Table II.

TABLE II—ANNUAL AVERAGE INCOME FROM AGRICULTURE

(*Rupees*)

Size-group	No. of household	Average income			
		Before adoption		After adoption	
		Total income	Average income	Total income	Average income
(1)	(2)	(3)	(4)	(5)	(6)
Below 1 hectare	3	5,010	1,670	8,770	2,923
1.01—1.50 hectares	14	25,210	2,515	55,930	3,995
1.50—2.01 hectares	8	28,210	3,526	35,760	4,470
Total	25	68,430	2,737	100,460	4,018

From the above table it is also seen that the per household income is directly related to the size of the operational holding. The average annual income shown in Table II gives a picture of the performance of the small farmers before and after the installation of the irrigation project. It may, however, be noted that out of the total net cropped area, 30 per cent are leased in land. As such, 20-50 per cent of the total product of these leased in lands will go to the owners of land and the annual income will be somewhat lower than shown in the table.

From the data of a recent *ad hoc* study by the Agro-Economic Research Centre[4] on the impact of an irrigation project, it is observed that most of the small farms have become economically sound units. Out of a sample 100 farms, 37 per cent were small farmers. In the year, 1968-69, the crop intensity in the small farms (upto 2.025 hectares) inside the command area of the irrigation project was found to be 127, whereas outside the command area,

4. A Study on the Impact of Mayong Lift Irrigation Project, Nowgong, Assam, Agro-Economic Research Centre for North-East India, Jorhat, 1975.

it was only 106. The yield rate within the command area has also improved substantially. The villages were revisited in 1974, and it was observed that both the small and big farms were engaged in the cultivation of HYV paddy in about 90 per cent of their irrigated fields and the yield rate was doubled. The data for the small farmers were not available separately. But it was observed that the small farmers also adopted the improved agricultural practices and during a short period of five years their economic condition improved appreciably.

CONCLUSION

The above facts have amply proved that there is immense scope for transforming the small farms into potentially viable units through the application of new agricultural technology. For the rapid improvement of the economic conditions of the small farmers in Assam, the installation of a network of irrigation projects should get top priority. For the adoption of improved agricultural practices, specially for cultivating HYV paddy in the winter months, provision of irrigation facilities is extremely necessary. If the irrigation facilities are made available, the farmers in the flood-affected areas can opt for crops that can be grown during flood-free winter periods. Opening of more agro-service centres in the rural areas will expedite the process of transformation of traditional agricultural methods.

The indirect benefit of the adoption of agricultural technology seems to be that it has created an awareness among the small farmers to increase their incomes so as to raise their standards of living. Now these small farmers are in a position to have a balanced family budget and they are expecting to have a surplus budget in the near future. The pessimistic attitude of the small farmers as is observed in other areas without such facilities, is found to be totally absent in the village under the new situation. The irrigation project combined with the adoption of improved agricultural technology has brought about rays of hope to the minds of the small farmers.